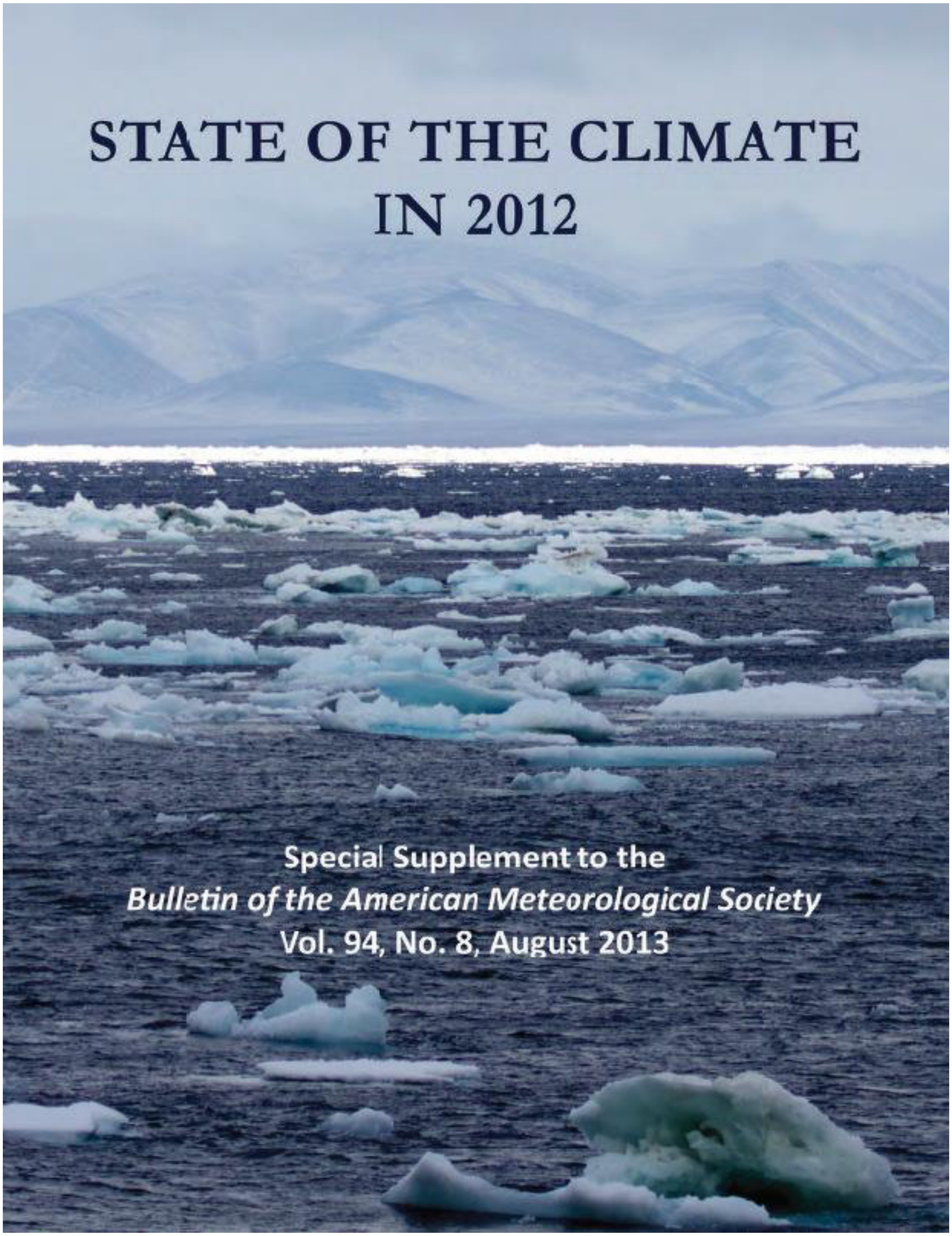
STATE OF THE CLIMATE
IN 2012
Special Supplement to the
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in February 2012 was 65% higher than the long-term mean and the seventh wettest.

A total of six tropical cyclones reached Mexican territory in 2012 [two (four) of them in the Atlantic (Pacific) basin]. Of those, two storms had significant impacts: on 15 June, Hurricane Carlotta made landfall on the Mexican Pacific coast and followed a trajectory to the northwest from Oaxaca and Guerrero to Michoacán. Despite bringing an important amount of rainfall at the initial stage of the rainy season, it damaged national infrastructure and set a new record for total daily precipitation at Tuxtepec, Oaxaca, of 350.0 mm (16 June 2012), surpassing the previous record of 342.0 mm (9 July 1956). The second storm, Hurricane Ernesto, made landfall on 7 August on the Caribbean coast and tracked through the country to reach the Pacific coast. Significant precipitation associated with Hurricane Ernesto was reported at various locations in the states of Tabasco, Veracruz, and Puebla. New daily precipitation records were set in at least two locations: Naranjal, Veracruz (353 mm), and Jacatepec, Oaxaca (344 mm), breaking records of 332.0 mm day^{-1} (18 September 1960) and 324.5 mm day^{-1} (25 July 1973), respectively.

In terms of agriculture, 2012 was considered a good year at the national scale, with a low incidence in crop losses due to a near-normal rainy season. When it comes to livestock, bovine milk production grew up by ~2% in comparison to 2011, though beef production still decreased as a result of a reduced population in cattle due to the long-term drought in 2011.

c. Central America and the Caribbean

1) Central America—J. A. Amador, E. J. Alfaro, B. Calderón, A. M. Durán-Quesada, H. G. Hidalgo, and I. L. Rivera

For this region, nine stations from five countries were analyzed. The stations located on the Caribbean slope are: Phillip Goldson International Airport, Belize; Puerto Barrios, Guatemala; Puerto Lempira, Honduras; and Puerto Limón, Costa Rica. The following stations are located on the Pacific slope: Tocumen International Airport and David, Panamá; Liberia, Costa Rica; Choluteca, Honduras; and San José, Guatemala. The analysis follows Amador et al. (2011) for all variables, except that the base period for computing anomalies was 1981–2010.

(i) Temperatures

The mean temperature (T_m) distributions for all stations are shown in Fig. 7.11. There was little departure from mean values at Phillip Goldson, Puerto Lempira, and Puerto Limón. Puerto Barrios presented a significant decrease in mean temperatures of the order of 2°C. The T_m skewness to the left at Phillip Goldson and Puerto Barrios on the Caribbean slope in both the climatology and for 2012 is remarkable, and is most likely a result of frequent cold front intrusions during the winter months. In all stations except Puerto Limón, the median T_m had a greater (15% to 30%) frequency than its corresponding climate value, and as a consequence, T_m presented less variability and lighter tails.

(ii) Precipitation

All stations showed normal wet season (May–November) values of maximum 5-day precipitation, wet season interquartile range (an indicator of variability), and wet season mean precipitation. During the wet season the total number of dry pentads was normal for all stations in 2012. In terms of the number of dry pentads during the wet season, Puerto Limón was on the cusp of being characterized as wetter-than-normal ($p=0.05$). Across the isthmus, the Pacific slope stations David, Liberia, Choluteca, and San José, showed a similar pattern of late starts and early ends of the rainy season. Tocumen was not considered in this analysis because of the large amount of missing data during 2012. The start and end of the rainy season is calculated as follows: starting from the beginning of the year, if in any particular pentad at time "t" the precipitation was greater or equal to 25 mm, and the precipitation of pentad t+1 was also greater or equal to 25 mm, and the precipitation of t+2 was greater than zero, it was considered that the rainy season started at time t. A similar procedure was used for computing the end of the rainy season, with the exception that the procedure was applied from the end of the year backwards.

The region was under the influence of El Niño conditions, based on positive values of the Multivariate ENSO Index, especially from April to September with stronger than average 925 hPa winds during July (inserted arrows in map in Fig. 7.11), a characteristic of El Niño events in the region and a condition unfavorable for tropical cyclone formation (Amador et al. 2006). During March–May 2012, large low-level convergence anomalies were found over the Caribbean and northern Central America increasing precipitation, whereas drier conditions were observed over southern Central America (mainly Costa Rica). Summer was characterized by a decrease in the moisture availability over the Caribbean Sea where the intensity of low-level winds increased compared to the base period (see inset map in Fig. 7.11), which resulted in the decrease of the moisture transport that contributes to precipitation over Central America. Note that the intensification of the Caribbean low-level jet enhances the trans-isthmic transport. The second part of the rainy season started with a marked decrease in the moisture availability for southern Central America (September). A generalized drier-than-normal peak during the second part of the rainy season (October) was observed in the interim reanalysis data.

(iii) Notable events

The year 2012 was near average for tropical storms in the Caribbean Sea (6°N–24°N, 92°W–60°W). In this basin there were four named storms, two hurricanes, and no major hurricanes. Hurricane Ernesto made landfall in Belize, but the main impact was to Guatemala where it produced intense rain, forcing 150 people to evacuate their homes due to floods and power cuts and damaging 30 houses. Guatemala reported drought conditions July–August with estimated losses over $10 million (US dollars). A low pressure system (18–29 May) and an upper-level trough (16–20 June) impacted Honduras, causing six and two fatalities, respectively. Costa Rica suffered through a "temporal" (a period of rain of variable intensity, lasting for several days and affecting a synoptic-scale region), that caused three fatalities during 27–30 June. Two more casualties were reported in early August due to the passage of an intense tropical wave. The indirect effects of Hurricane Isaac (see Peña and Douglas 2002 for mechanisms) were felt in Costa Rica around 15 October, causing floods in the north, the Central Pacific, and the Central Valley. Temporal conditions in Costa Rica (21–25 October), associated with the indirect effect of Hurricane Sandy, produced intense rainfalls over the nation's Pacific coast, caus-

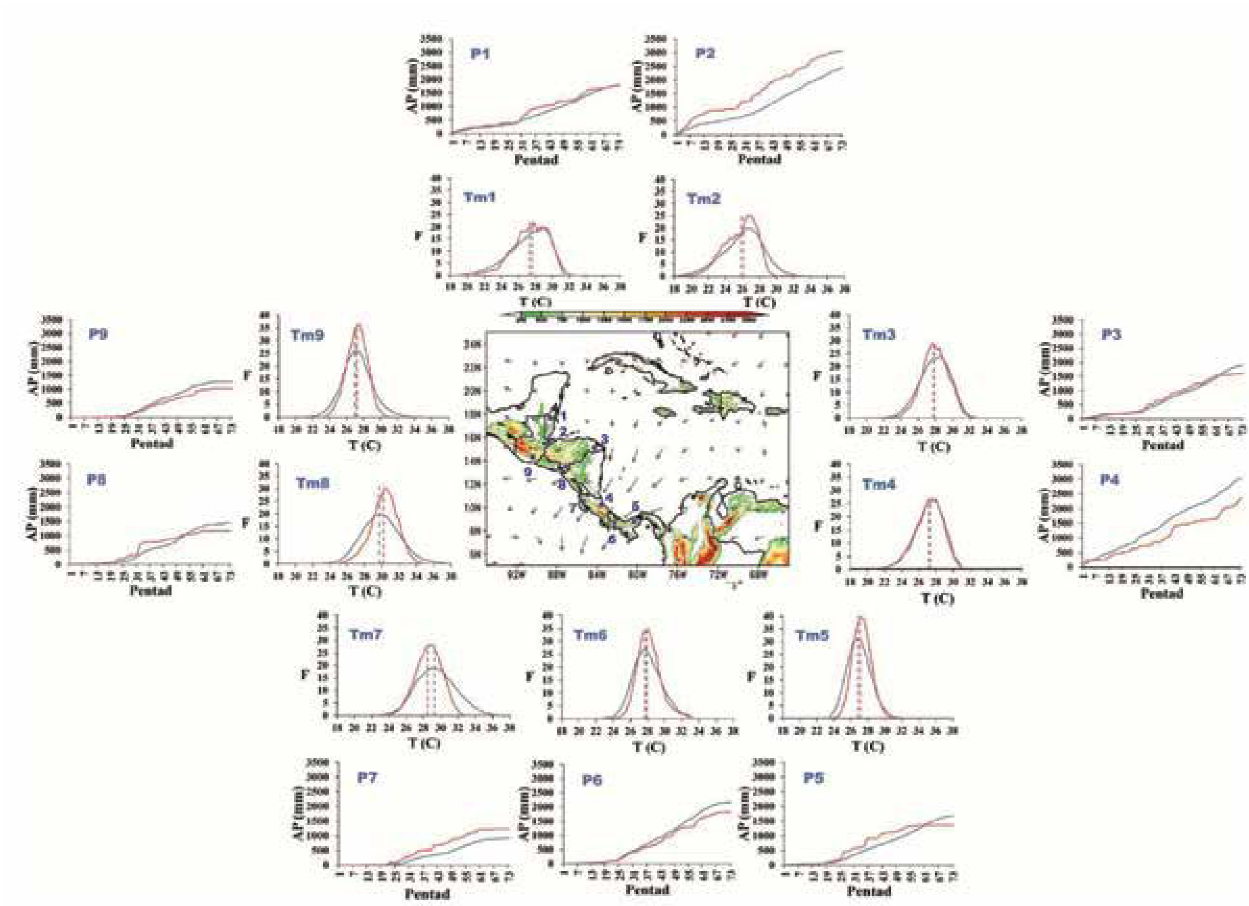

Fig 7.11. Mean surface temperature (Tm) frequency and accumulated pentad precipitation (P) time series shown for the 9 stations (blue dots depict station location) in Central America: (1) Phillip Goldson International Airport, Belize; (2) Puerto Barrios, Guatemala; (3) Puerto Lempira, Honduras; (4) Puerto Limón, Costa Rica; (5) Tocumen International Airport, Panama; (6) David, Panama; (7) Liberia, Costa Rica; (8) Choluteca, Honduras; and (9) San José, Guatemala. The blue line represents the 1981–2010 mean and the red line shows 2012. Wind anomaly vectors at 925 hPa, based on 1981–2010 base period for July, are also shown. Map also shows regional elevation (m). (Source: NOAA/NCDC.)

ing overflowing rivers, landslides, and damage to roads and houses. These conditions affected more than 3000 people due to floods, landslides, obstructed roads, fallen electrical wires and trees, and also damaged 922 houses in Panama. Heavy rainfalls resulted in three casualties in Panama on 25–29 November.

2) The Caribbean—M. A. Taylor, J. Campbell, T. Stephenson, and A. Trotman

This report covers the island chain of the Caribbean basin. Unless otherwise noted, records set are with respect to the following years for the following territories: Jamaica, 1952; Puerto Rico, 1898; St. Croix, 1972; St. Thomas, 1953; Antigua, 1928; Grenada, 1985; Dominica, 1982; and Barbados, 1942. Normal conditions for these and other territories discussed are estimated from the 1981–2010 base period, unless otherwise noted.

(i) Temperatures

The Caribbean was warmer than usual in 2012, particularly over the Greater Antilles (Fig. 7.12a). This was due to an unusually warm second half of the year (Fig. 7.12b). Summer 2012 (June–August) was the third warmest in the San Juan metro area, Puerto Rico, with June being its warmest month ever recorded. San Juan also had its eighth warmest July, warmest August, fourth warmest October, warmest November, and ninth warmest December. St. Thomas had its eighth warmest June, seventh warmest October, and ninth warmest November. St. Croix had its ninth warmest October. In Jamaica, mean maximum temperatures for November through December exceeded the 1992–2011 average. Prior to summer, the tendency was for normal to below-normal temperatures. Antigua had its 3rd coldest May and Puerto Rico had its 11th coolest May. The temperature variations were due in part to dramatic sea surface temperature (SST) anomaly changes over the tropical Atlantic during 2012. Positive 2011 anomalies rapidly disappeared during the winter (December–February) months. A dramatic upswing in the North Atlantic Oscillation (NAO) around 1 May resulted in weak trade winds and anomalous warm SSTs that lasted through October.

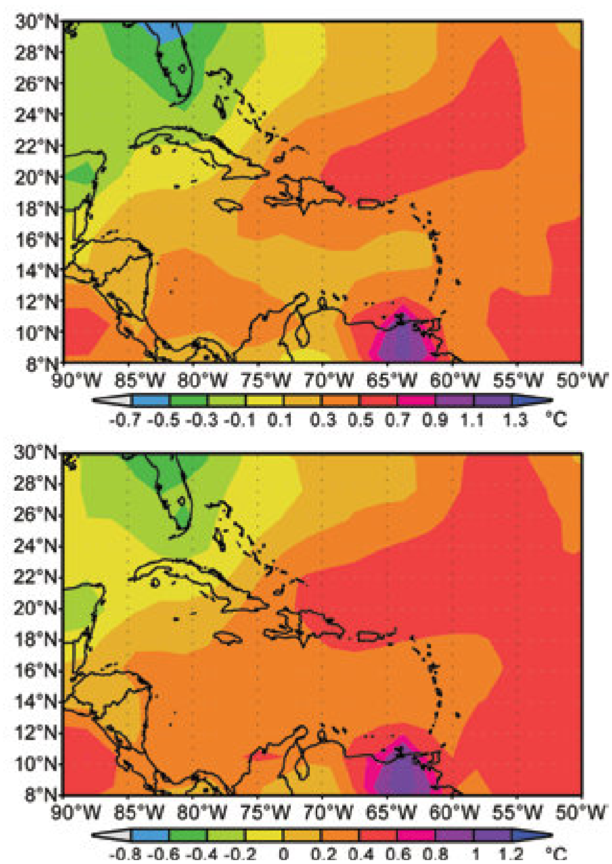

Fig. 7.12. (a) 2012 and (b) Jun–Nov 2-m temperature anomalies (°C) for the Caribbean basin. Anomalies are with respect to 1981–2010 base period. (Source: NCEP/NCAR reanalysis.)

(ii) Precipitation

The Caribbean experienced a dry 2012. The northwest Caribbean and northern Lesser Antilles were drier than normal (Fig. 7.13). This would also have been true for the southern Caribbean had it not been for an anomalously "wet" dry season (December–April) at the start of the year.

Weak-to-moderate La Niña conditions at the start of the year resulted in a dry north-wet south rainfall gradient. Consequently, January–May was much wetter than normal for Trinidad, Tobago, and Grenada. January rainfall was 156%, 184%, and

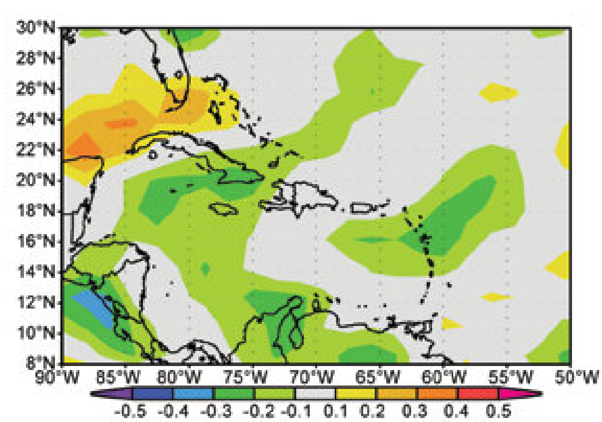

Fig. 7.13. 2012 rainfall anomalies (mm) with respect to 1981–2010 base period. (Source: NCEP/NCAR reanalysis.)


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